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PROGRESS REPORT

Period of July 1, 1964 to July 31, 1964

Contract Number AF33(600)40280

Westinghouse Electric Corporation

Aerospace Division

Box 746, Baltimore 3, Md. 21203

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A F-101 FLIGHT TEST

The 300 hour periodic inspection on the F-101 aircraft has occupied the entire month, preventing any test flights. Initial inspection revealed internal oil leaks in the left engine and out-of-tolerance cracks in the turbine nozzle of the right engine. Replacement engines were received a week after placement of order. Several structural areas have been found with minor damage such as cracks and pulled rivets, which will be repaired before flight. The periodic inspection, including T.O. and TWX compliance, is about 50% complete, with the functional test flight scheduled for 1 September. Additional T.O.'s and TWX's have been received since the start of inspection which must be performed prior to flight. Approximately 200 man hours are required to complete these additions.

During the aircraft inspection, extensive tests have been performed on the system receiver. Applying a 27 nanosecond RF pulse to the system, the limiting IF amplifier output was satisfactory, with the pulse stretched to approximately 33 nanoseconds, and overshoots 15 to 18 db below peak. The output of the video amplifier showed many high amplitude overshoots. Gain-bandwidth modifications will be made on the video amplifier to minimize overshoots.

During April a tunnel diode amplifier was added between the TR tube and receiving traveling wave tube. Transmitted power burned out the diodes almost instantly. An amplifier with an added varactor limiter and new tunnel diodes operated satisfactorily during transmitter operation. Gain of the tunnel diode amplifier is 17 db, with system noise figure reduced from 11.5 to 6.5 db.

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Pattern tests on the antenna removed from the pod indicated the azimuth pattern twice normal width. The manifold twists to the two front modules were found to be 180° out of phase. The manifolds and modules had been incorrectly installed following a pressure failure on flight S112. The poor azimuth pattern existed then for flights S113 and S114. The reversal has been corrected.

The fiberglass bottle in the antenna pressurization system was exchanged for a stainless steel bottle in the F-101 installation. The light fiberglass bottle will be used for the second deliverable system. Stainless steel was much cheaper and could be used in the F-101 where weight is not as critical.

B PHASE II FLIGHT TEST

Checks were performed on the antenna servo driving the installed antenna. Binding on the slide rail bearing which caused erratic antenna motion was probably a result of the change in antenna pitch angle from 7.5 to 4.9 degrees. Chamfering the rail and other modifications removed the sticking.

Using the Functional Test Unit to supply pitch and drift inputs for the antenna servo, the angular motion of the antenna followed the input as predicted. The next test was to use the INS to provide pitch and drift information. Difficulty was first encountered in obtaining outputs from the INS. After correction, it was determined that the servo scale factor_ inches of actuator travel per volt of drift input_ was incorrect, as was also the ratio of pitch to drift input. The first step is to determine more precisely the INS output scale factors--volts per degree of pitch and drift--and then adjust scale factors in the summing network of the antenna servo. This will be attempted when the INS and installed antenna are again available.

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Testing continued on the first delivered system, 002. After replacement of the pulse forming network and thyrite resistors in the transmitter, performance was good except output power was low. Installing a new cross field amplifier and replacing the filament transformer because of the new tube design increased the average filtered output power to 88 watts. Pulse width and spectrum were good. More power could be obtained, but will not be increased until desired for flight.

Best focus for the CRT in recorder 007 gave 2 mil trace width with the focus pot at the end of its adjustment. Adding 150 volts to the range of the focus pot reduced the line width to 1.5 mils. Since the longer CRT's now used will normally require this greater focus range, a power supply will be added on the frame.

The film drive tested satisfactorily, with a film speed of 1.273 inches/second occurring at 864.6 knots ground speed and 400 cps inverter frequency. Film density as a function of lens setting and CRT bias was taken to establish lens aperture, bias and video drive. Film Jamming occurred when short lengths of film were used; adding film on the take-up spool corrected the jamming.

Major items delivered to the Phase II testing area were:

(1) waveguide with quick disconnect flanges

(2) high temperature flexible waveguides

(3) spherical and corner reflectors

(4) reflector alignment tool

(5) instrumentation mode switching test panel

(6) recorder 006.

The reflectors are to be installed at a site already selected in a pattern to check azimuth and range resolution and target detectability.

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C ENVIRONMENTAL TEST

The report on the high temperature test of the flexible waveguide was compiled and released as memorandum STM 161.

D RECORDER

Recorder 005 was returned from the Phase II testing area to Itek for updating in the following areas:

(1) addition of optical field flatteners to both optical paths for improvement of range resolution at the beginning and end of sweeps

(2) complete change-over of the dynamic focus waveform circuitry to provide more nearly correct focus voltage on the CRT throughout the range sweep

(3) increase in magnetic shielding around the CRT to improve the isolation from stray fields

(4) relocation of the variable frequency power supply for the film capstan motor external to the recorder to reduce 400 and 800 cps pickup.

During inspection of this recorder, it was found that the capstan was damaged. The capstan from the equipment spares was used as replacement. The damaged capstan will be returned to spares when repaired.

The above modifications were completed on recorder 006 before it was delivered to the Phase II testing area this month. Recorder 007 will now be returned to Aerospace for similar modification.

All recorder work was completed at Itek this month, except for acceptance tests on a high voltage power supply, completion of the modifications to recorder 005, and delivery of the residual inventory.

All high voltage power supplies have been updated to provide longer operating life.

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A small test set-up for determining deleterious effects of CRT focus is now under construction. Although the CRT is capable of 0.6 to 0.65 milli-inch spot dimension at the center of the tube, the spot measures somewhat greater than 0.8 milli-inch in the recorder. Measurements will be made to determine if this value can be reduced further without an elaborate recorder modification.

E ANTENNA

Bonds of the I8 fabric to the antenna sticks are still failing because of the formation of bubbles between the fabric and metal during the final cure. Variations of cure times and prebaking of the fabric have little effect on the appearance of the bubbles.

The developer of the Doryl resin and I8 fabric concluded that the Doryl used had deteriorated due to an unknown contaminate. Testing several single sticks with a new sample and with the original batch proved that the resin had deteriorated but that the bubbles were caused by other factors. Further testing on various fabrics indicated that the bubbles form on the production sample of the I8 fabric but not on the original material. The only apparent difference between the fabric samples was the method of applying the varnish to the cloth. Further testing will be performed on new fabric when it is available next month.

F SYSTEM

Failure reports for the months of April, May and June for the Phase II effort showed 107.1 hours standby time and 17.7 hours transmit time. Failures occurred in the following units:

Recorder	6
Frequency Generator	2
Transmitter	2
Doppler Tracker	1

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Mean time between failure then calculated to be 11.8 hours in standby and 9.8 hours in transmit. These figures should improve as field personnel become more experienced and initial installation debugging is completed.

G SPARES

During this period, 26 items have been added to the spares list, most of them resulting from updated recorder drawings. With five deleted items, the equipment spares now lists 1076 items, of which 970 have been delivered.

On the spares list for Ground Support Equipment, 40 of the 592 items have not been delivered. Thirty of these items are on open purchase order.

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